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Refinement of Near-Highway Air Pollution Exposure Using Time-Activity Reports and Traffic Indicators

Christina Hemphill Fuller¹, Doug Brugge², Wig Zamore³, and John Durant⁴

¹Harvard School of Public Health, Boston, MA; ²Tufts University School of Medicine, Boston, MA;

³Somerville Transportation Equity Partnership, Somerville, MA; ⁴Tufts University School of Engineering, Medford, MA

Background and Objectives: A significant portion of urban air pollution derives from motor vehicle exhaust on highways and busy streets. Recent studies have shown that the near-highway environment contains elevated concentrations of ultrafine particles (UFP; diameter < 0.1 micrometer), which is a concern because UFP is generally more toxic than larger particles. The purpose of our study is to examine the cardiovascular effects of exposure to UFP near Interstate 93 within the densely populated and ethnically diverse city of Somerville, MA. Ours is a community-based participatory research project incorporating participation from both community and academic partners.

Methods: We are creating methodology to more accurately characterize measures of exposure through inclusion of (1) participant time-activity reports, (2) Geographic Information System (GIS)-based traffic indicators, and (3) high-resolution monitoring data. The area of study is a 400-meter buffer on both sides of Interstate 93 in southeast Somerville. Participants are recruited from a randomly selected list of addresses within the study area, and they complete a time-activity record of their time in various microenvironments. Participant homes are marked with Global Geographic Positioning (GPS) coordinates. Environmental measurements of particle number are collected alongside the highway as representative of UFP. Traffic indicators (e.g., length of roadway around home) are measured using GIS.

Results and Conclusion: We are developing a new methodology using available information on traffic indicators, high-resolution near-highway pollutant measurements, and time-activity reports to better measure exposure to highway-related air pollution. This exposure measure will be used to evaluate the effect of UFP and other pollutants on cardiovascular health.